



The effects of flower frequency dependence for pollination in a similarity and spatial cluster gradient (working copy)

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1 Introduction

2 Methods

2.1 Data Collection

The Jena Experiment:

- N50°55' E11°35' ; 130 m a.s.l.
- Established in 2002
- Total Size: 10 hectares
- Arable field for 40 years before experiment started (therefore strongly fertilized)
- Plots are mowed every June and September
- Main experiment has 82 plots, each 20x20m (400m²)
- Originally sown species mix of 1,2,4,8,16 or 60 species, divided into four blocks (randomized complete block design) along abiotic gradients (mainly soil sand content)
- Part of the Plot is weeded twice a year (not my sampling area)

2.1.1 Choosing Species and Plots

The parts of the plots with continuous weeding were normally very scarce with flowers and had a very low species richness. So I collected the data in the “old invasion plots” (4m x 5.5m , 22m²) and in the “new invasion plots” (5m x 3.5m, 17.5m²) with a much higher cover, species richness and diversity. The ”old invasion plots” were not weeded since the first seeding in 2002. The ”new invasion plots” were not weeded since 2009.

I chose 5 species to observe (Those species were chosen because they were present in min. 5 plots with a differing frequency):

Table 1: Focal Species

Short	Name	German Name	Order	Family	Color
Ono	Onobrychis viciifolia	Saat-Esparssette	Fabales	Fabaceae	pink+white
Lat	Lathyrus pratensis	Wiesen-Platterbse	Fabales	Fabaceae	Yellow
Lot	Lotus corniculatus	Gewöhnliche Hornklee	Fabales	Fabaceae	Yellow
Ger	Geranium pratense	Wiesen-Storchschnabel	Geraniales	Geraniaceae	Purple
TP	Trifolium pratense	Wiesen-Klee	Fabales	Fabaceae	Purple

Because the vegetation changed very quickly (heavy rain and very warm temperatures alternating) I chose max. 7 plots (= 14h) to observe at a time. Every time I finished a session I did a new sampling of all 82 plots of the Jena Experiment to check for suitable plots with focal plant species and their frequencies for the next round. Those observations were randomly distributed over the next days to prevent time dependencies (observation times over the whole day for each plot)

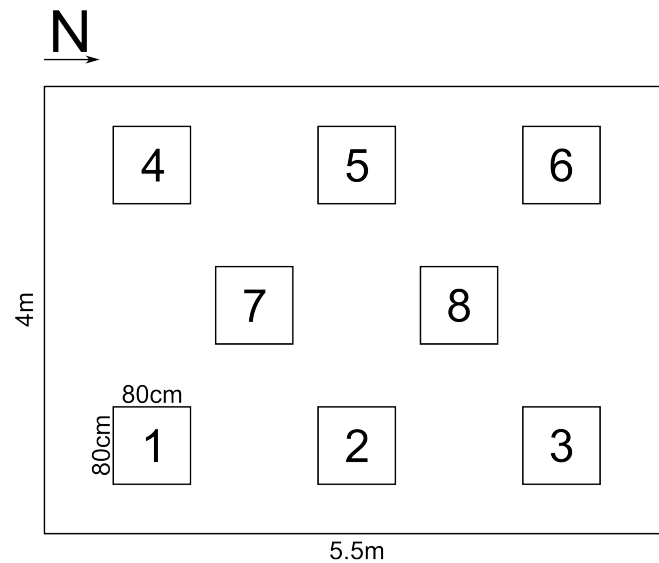


Figure 1: The sampling design within a plot

2.1.2 The Sampling

- Observations were made only during good weather conditions (max partly overcast, no rain, max light wind, min. 15 degree)
- Sampling time between 9am and 5pm (there was normally heavy fog and moist in the mornings so I could only start sampling from 10 or even 11)
- Sampling occurred between 20.7. - 12.8.
- Total of 15 sampling days (due to weather conditions)
- The pollinators were divided into bees, bumblebees, hoverflies and “other”
- sampled eight of the 80x80cm patches per plot to get 2h of data per frequency and get a good mean over the plot (flowers were often in clusters and not distributed over the whole plot)
- Patches were distributed as shown in Figure 1
- When the flowers were very unevenly distributed over the Plot (which happened especially at low frequencies) I chose to observe some patches which contained flowers of the chosen species twice
- I normally observed two species at once to save time/get a larger dataset. If there were not too many flowers that was easy feasible. If there were Plots with unevenly distributed flowers as explained above I observed the regular 1-8 patches for the evenly distributed species and additionally doubling patches for the uneven species.
- Eg. Geranium was flowering at all 8 patches, Lotus only in the southern part (patch 1,2,4,5, and 7). I regularly observed all patches 1-8 for Geranium. Because I was missing 3 patches for Lotus I doubled 1, 7 and 5. During this doubling I still kept track of visitors of the Geranium flowers. So in the end my dataset was the following:
 - 8+3 Geranium observations
 - 8 Lotus observations

2.2 Statistical Analysis

2.2.1 The Data

Within the 4 weeks of sampling I got 386 entries, each equivalent to 15min of observation

- Flower visits to the focal species within the patch (divided by pollinator type)
- Flower visits to other flowers except the focal species in the patch (divided by pollinator type)
- Species Richness in the Patch (with names)
- Species Richness in the Plot (with names and quantities)
- Floral Cover in Patch and Plot (own estimation)
- Frequency of the focal species in Patch and Plot
- Count of individual flowers respectively inflorescence of the focal species
- PlotID
- PatchID
- Date/Time

2.3 The model

Results

Describe your results here...

Discussion

3 Discussion

4 Conclusions